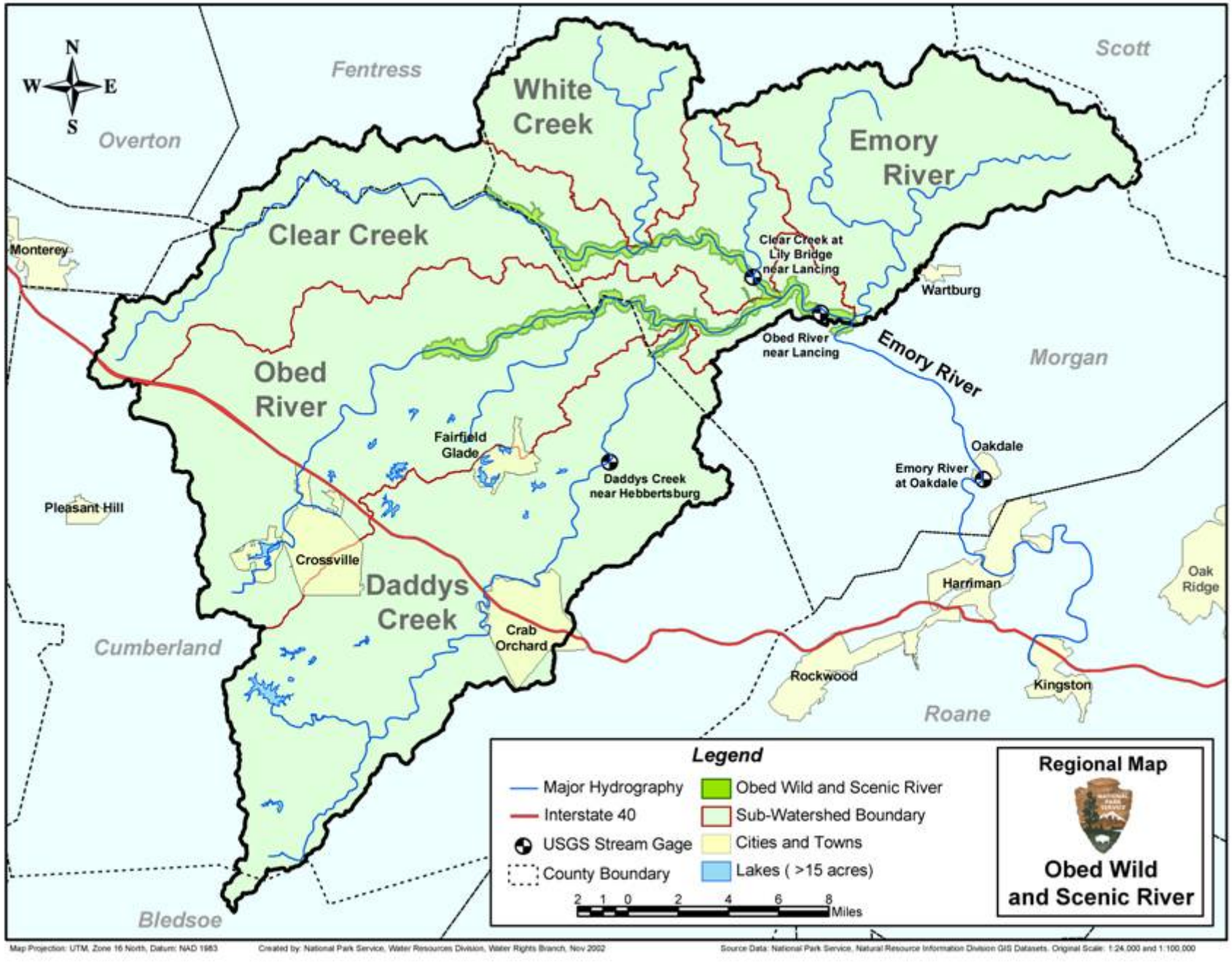
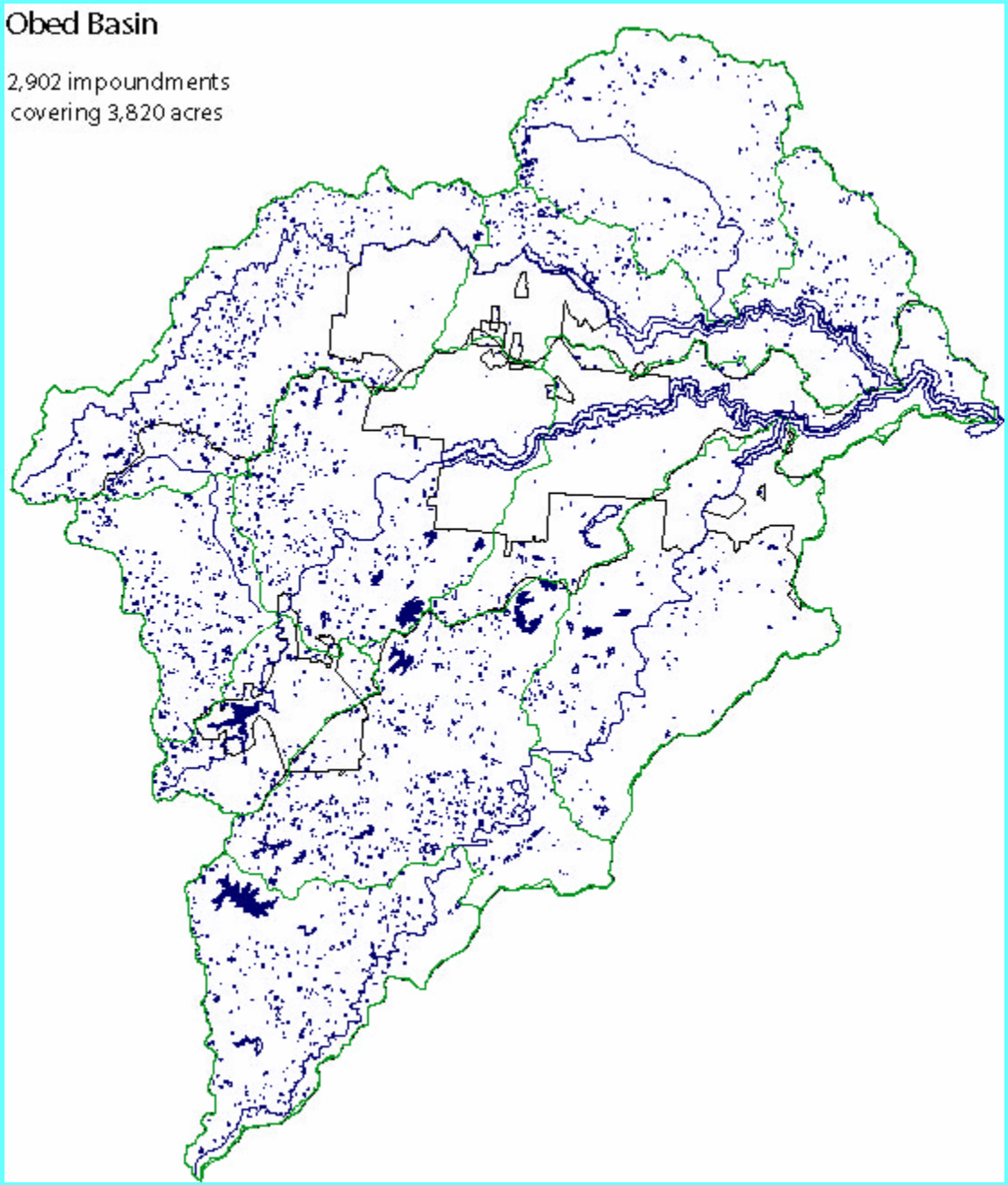
Obed Wild and Scenic River

The effects of impoundments on flow in the Obed Wild and Scenic River watershed: preliminary results of a paired basin study


N
W
E
S
Fentress
Scott
Overton
White Creek
Emory River
Clear Creek
Monterey
Clear Creek at Lily Bridge near Lancing
Wartburg
Obed River near Lancing
Emory River
Morgan
Obed River
Fairfield Glade
Daddys Creek near Hebbertsburg
Oakdale
Emory River at Oakdale
Pleasant Hill
Crossville
Daddys Creek
Harriman
Oak Ridge
Crab Orchard
Cumberland
Rockwood
Kingston
Roane
Bledsoe
Legend
Major Hydrography
Interstate 40
USGS Stream Gage
County Boundary
Obed Wild and Scenic River
Sub-Watershed Boundary
Cities and Towns
Lakes (>15 acres)
2 1 0 2 4 6 8
Miles
Regional Map
Obed Wild and Scenic River
Map Projection: UTM, Zone 16 North, Datum: NAD 1983
Created by: National Park Service, Water Resources Division, Water Rights Branch, Nov 2002
Source Data: National Park Service, Natural Resource Information Division GIS Datasets. Original Scale: 1:24,000 and 1:100,000

3,800 impoundments of various sizes have been built in the Obed Basin.

What is there combined effect on the Obed W&SR hydrology?


Obed Basin
2,902 impoundments
covering 3,820 acres

A paired watershed study was initiated to begin the evaluation

- Objective: to evaluate the effects of impoundments on flow quantity and timing from headwater areas of the Obed River Basin

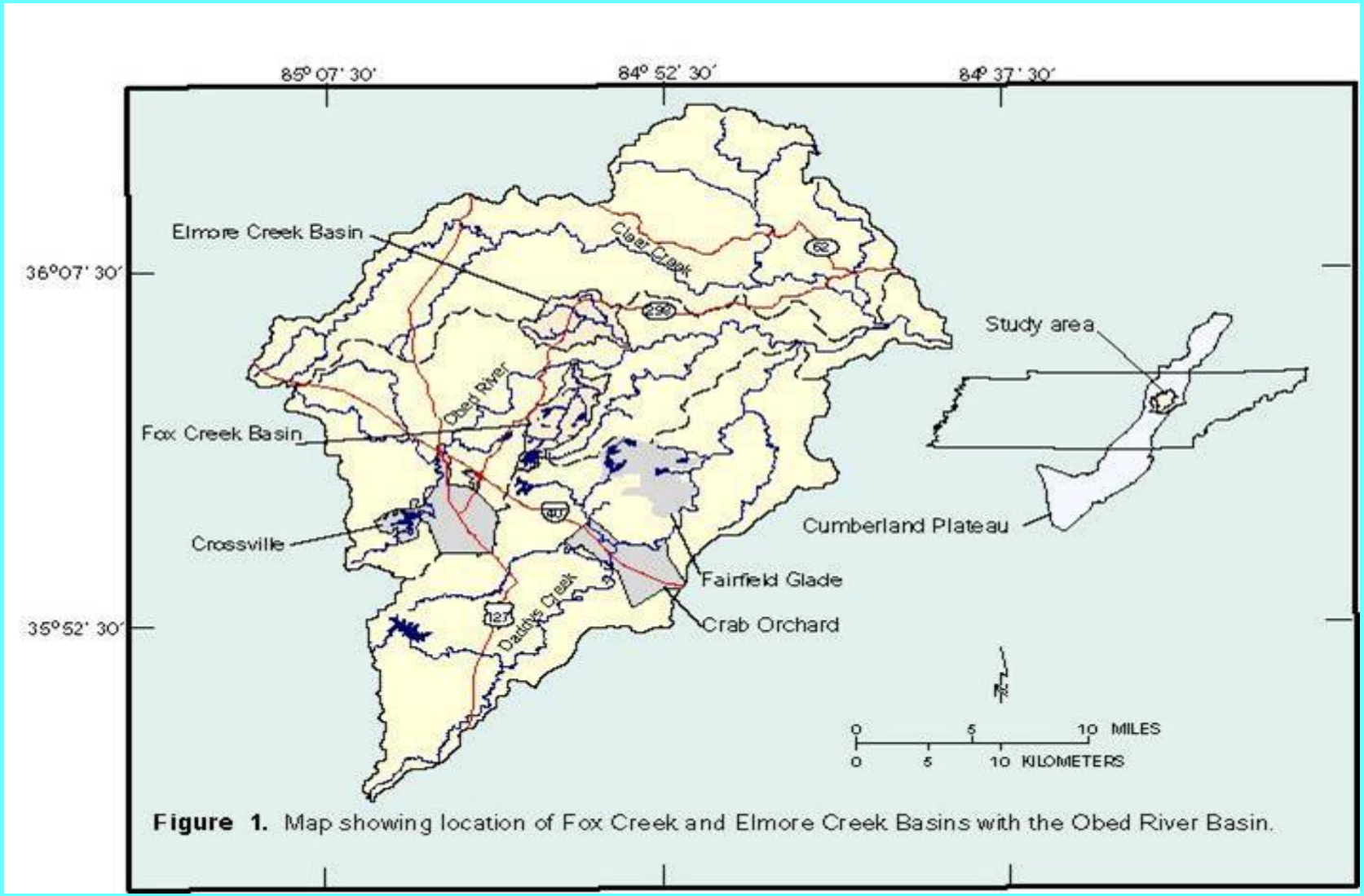
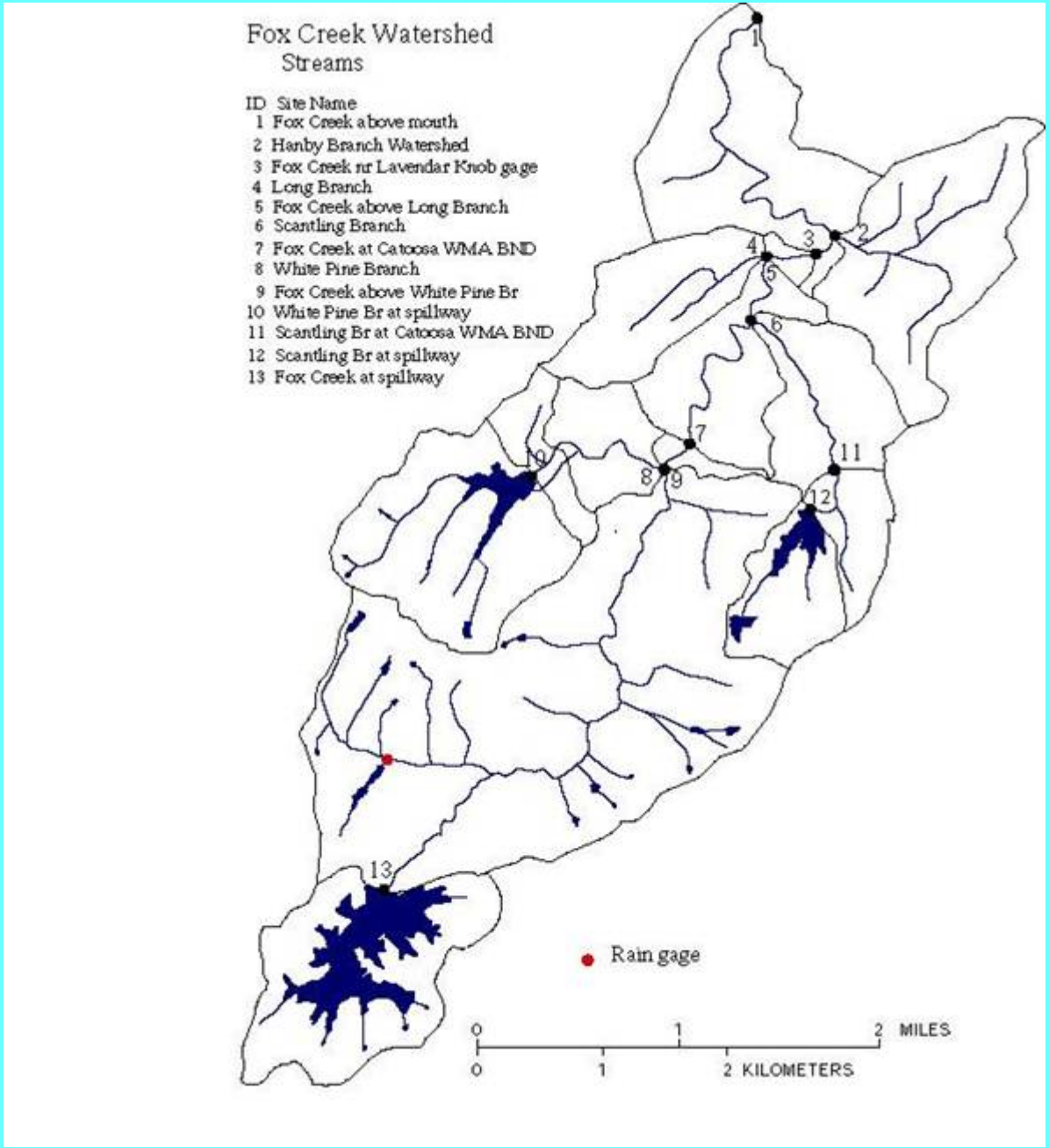
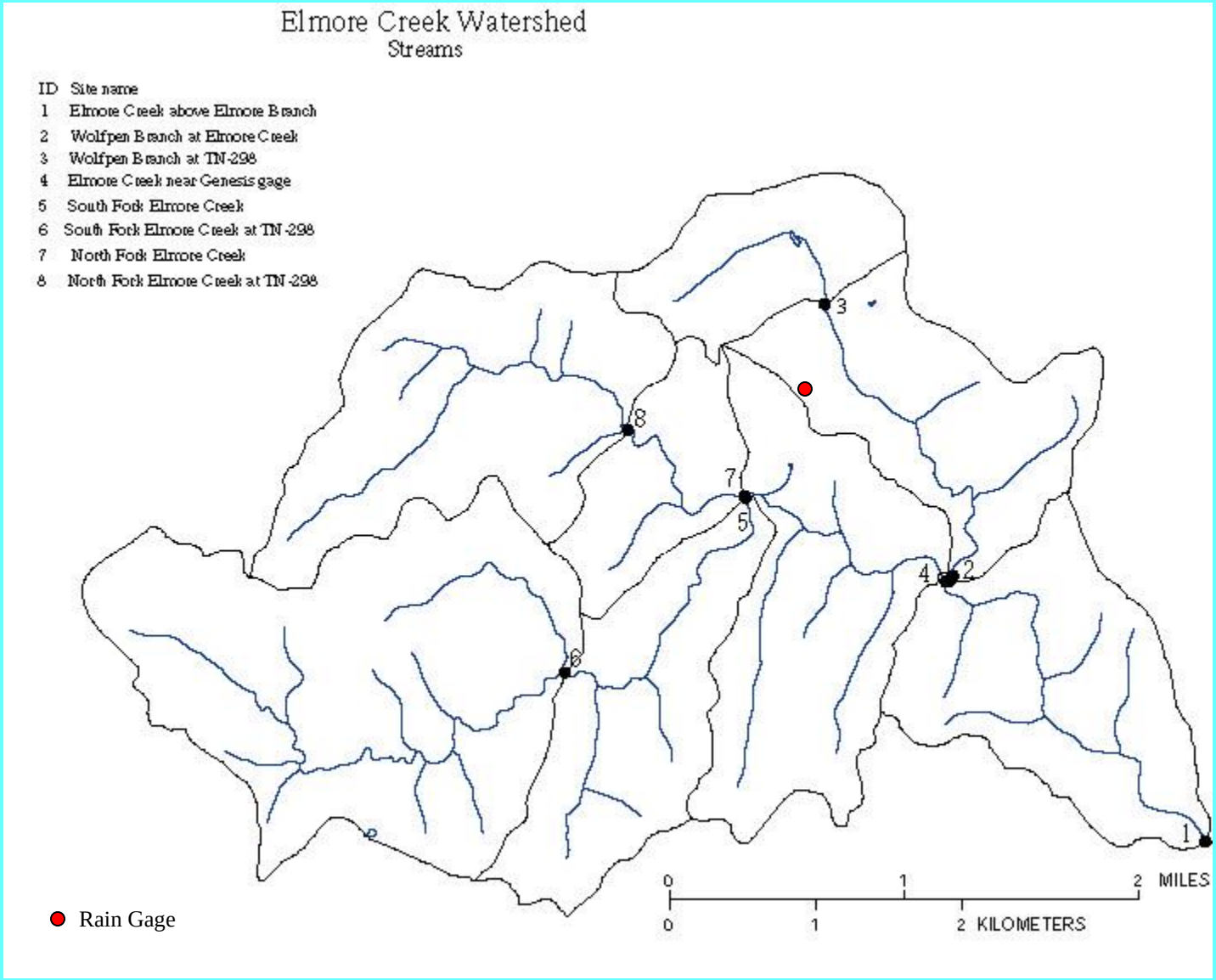


Figure 1. Map showing location of Fox Creek and Elmore Creek Basins with the Obed River Basin.

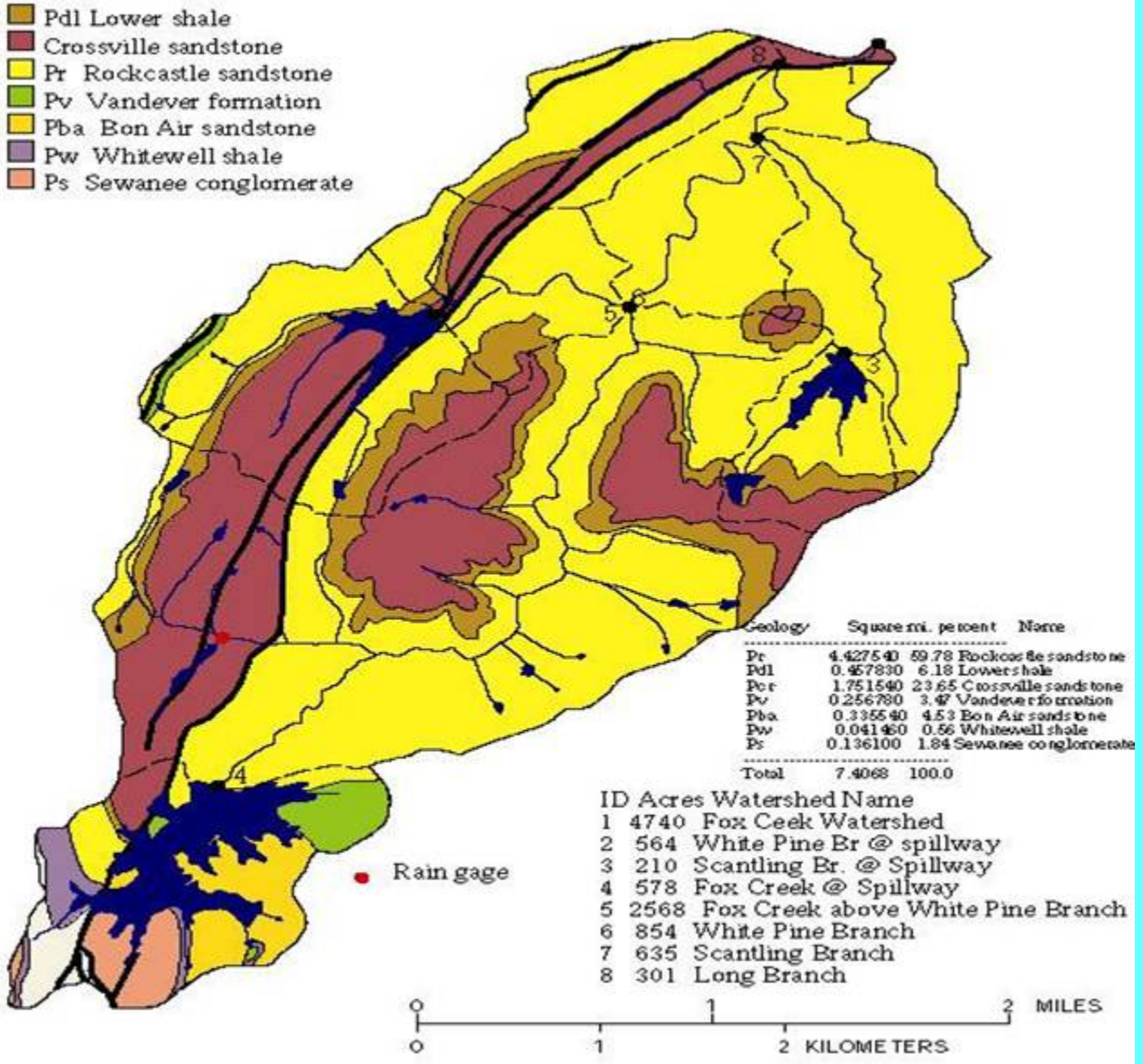
Basin characteristics

Fox Creek	Elmore Creek
7.38 sq.mi.	7.82 sq.mi.
1,627 ft elevation at gage	1,494 ft elevation at gage
1,900 ft elevation at divide	1,840 ft elevation at divide
221 acres of ponds	~1.6 acres of ponds
1,352 acres controlled by ponds	~5 acres controlled by ponds
South side of Obed Gorge	North side of Obed Gorge


Fox Creek Watershed
Streams
ID Site Name
1 Fox Creek above mouth
2 Hanby Branch Watershed
3 Fox Creek nr Lavendar Knob gage
4 Long Branch
5 Fox Creek above Long Branch
6 Scantling Branch
7 Fox Creek at Catoosa WMA BND
8 White Pine Branch
9 Fox Creek above White Pine Br
10 White Pine Br at spillway
11 Scantling Br at Catoosa WMA BND
12 Scantling Br at spillway
13 Fox Creek at spillway
Rain gage
0 1 2 MILES
0 1 2 KILOMETERS

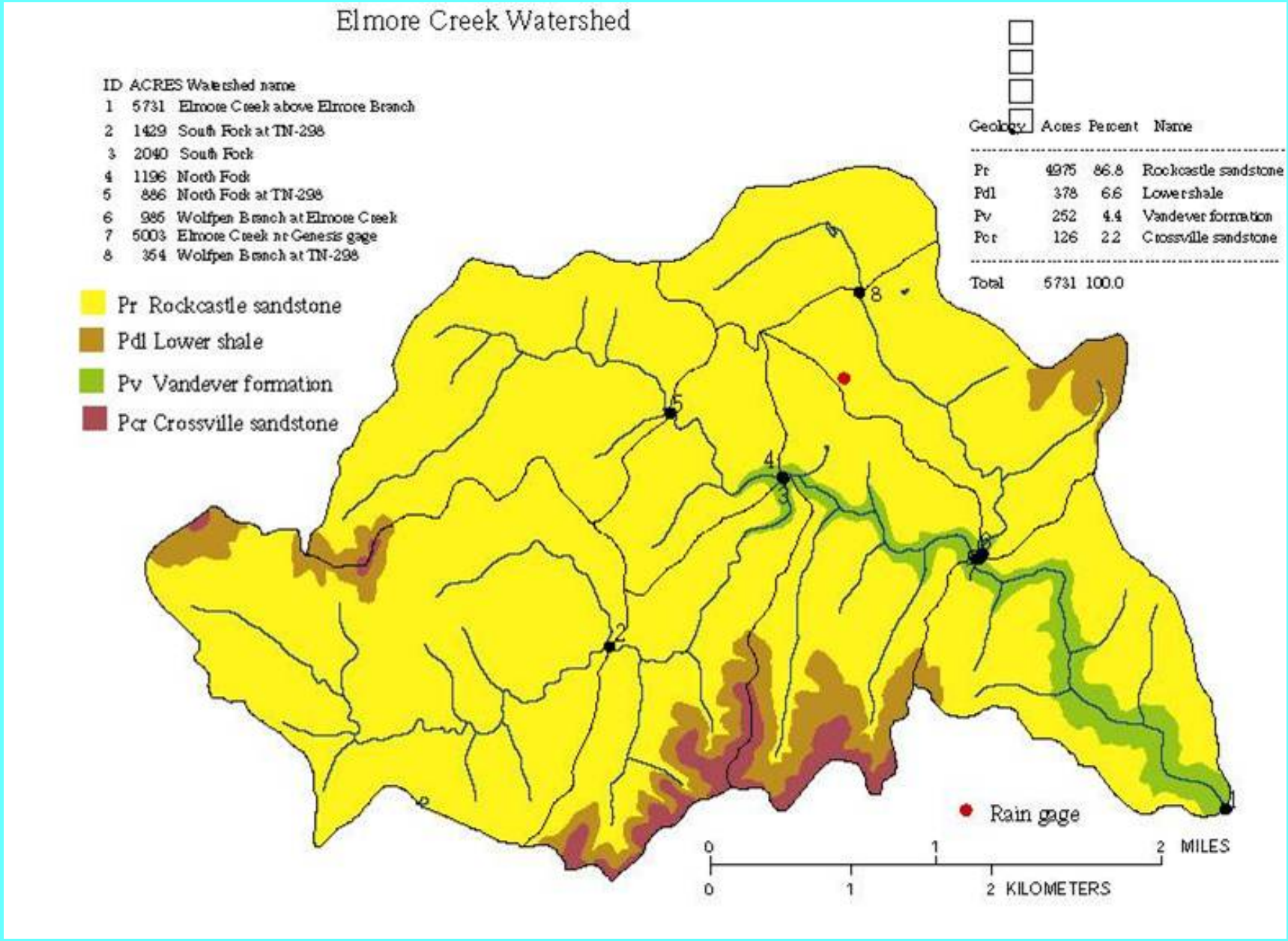

Elmore Creek Watershed
Streams
ID Site name
1 Elmore Creek above Elmore Branch
2 Wolfpen Branch at Elmore Creek
3 Wolfpen Branch at TN-298
4 Elmore Creek near Genesis gage
5 South Fork Elmore Creek
6 South Fork Elmore Creek at TN-298
7 North Fork Elmore Creek
8 North Fork Elmore Creek at TN-298
Rain Gage
0 1 2 MILES
0 1 2 KILOMETERS

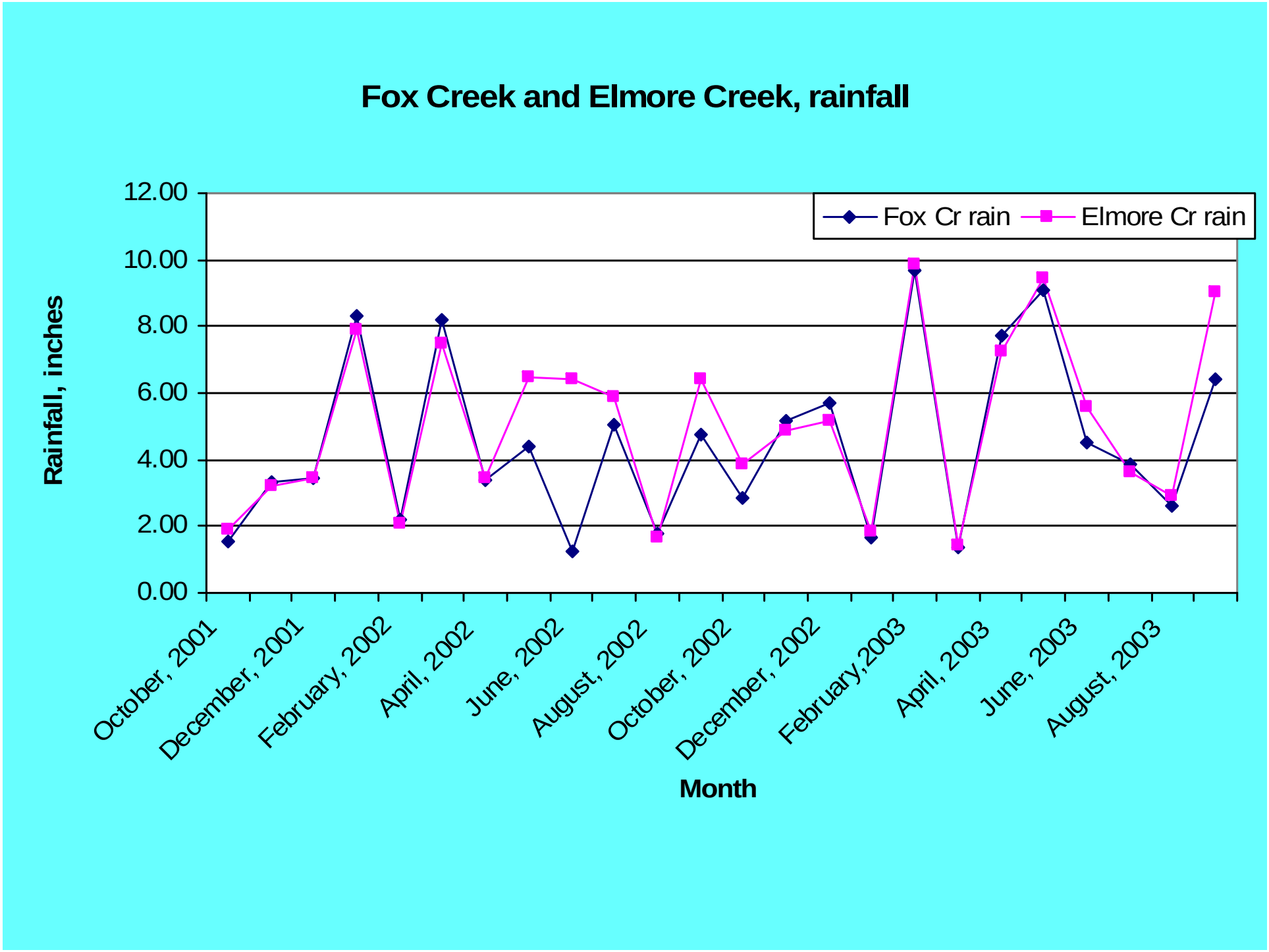
FOX CREEK

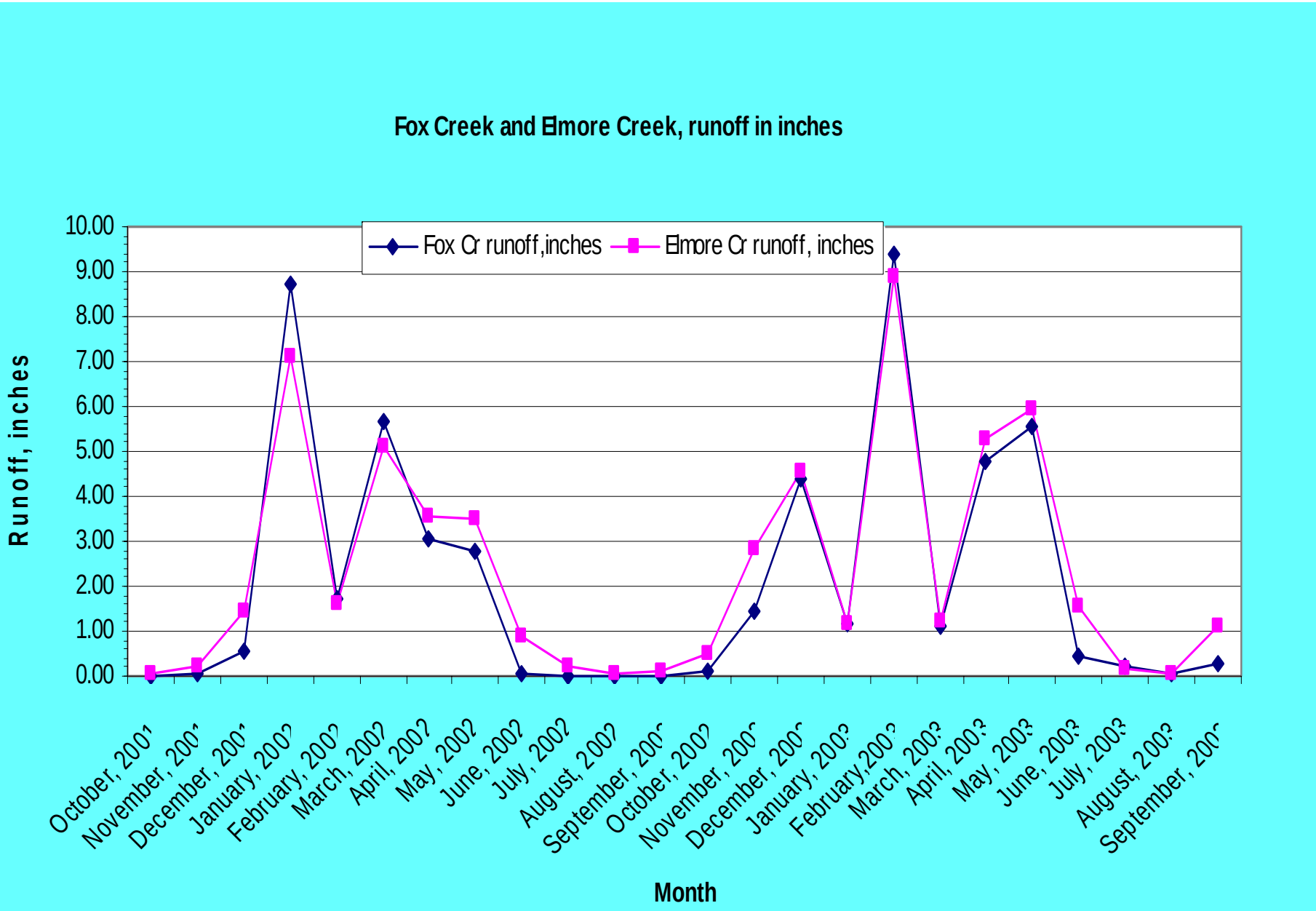


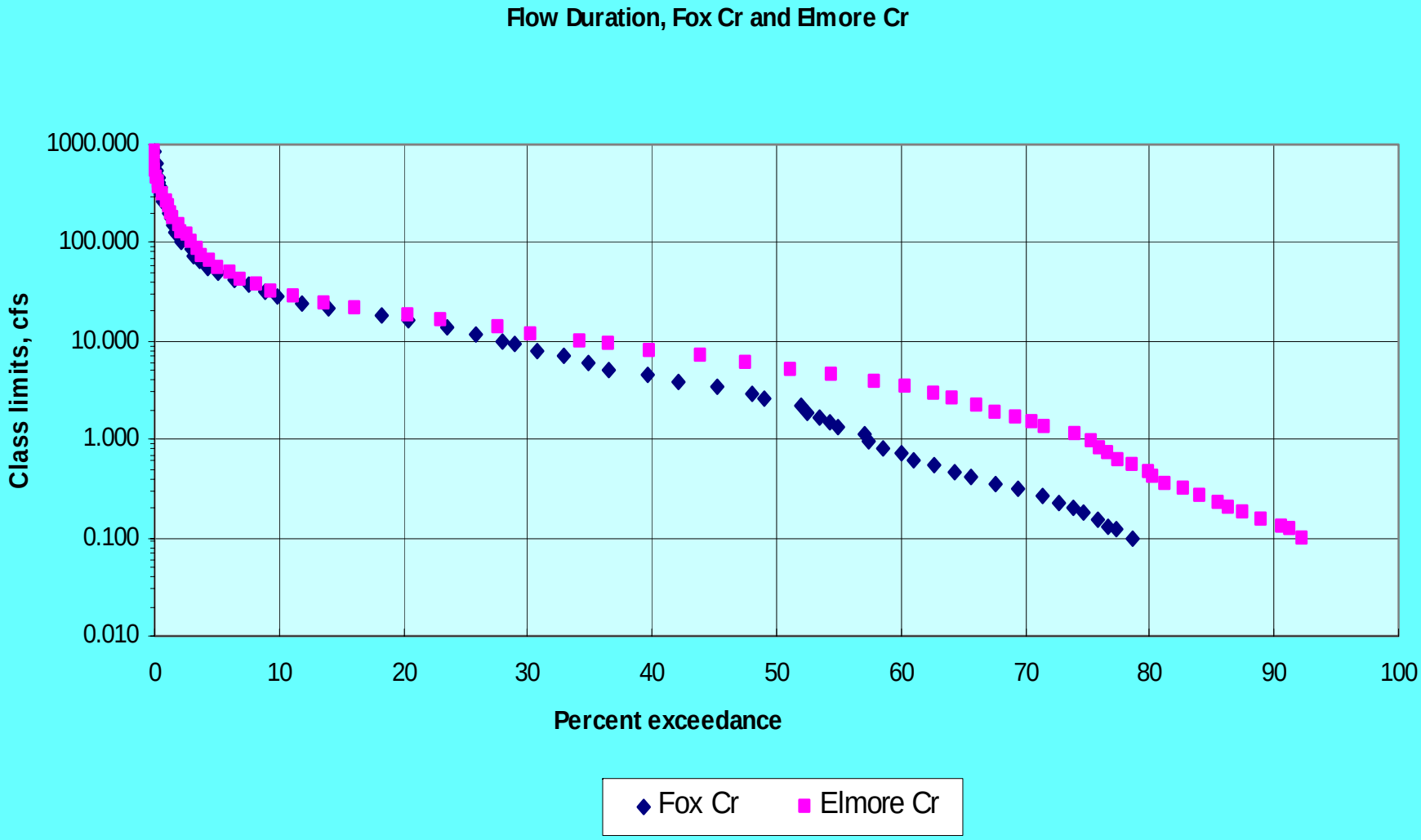
Geology	Square mi.	percent	Name
Pr	4.427540	59.78	Rockcastle sandstone
Pdl	0.457830	6.18	Lower shale
Pcr	1.751540	23.65	Crossville sandstone
Pv	0.256780	3.47	Vandever formation
Pba	0.335540	4.53	Bon Air sandstone
Pw	0.041460	0.56	Whitewell shale
Ps	0.136100	1.84	Sewanee conglomerate
Total	7.4068	100.0	

ID	Acres	Watershed Name
1	4740	Fox Ceek Watershed
2	564	White Pine Br @ spillway
3	210	Scantling Br. @ Spillway
4	578	Fox Creek @ Spillway
5	2568	Fox Creek above White Pine Branch
6	854	White Pine Branch
7	635	Scantling Branch
8	301	Long Branch


Elmore Creek Watershed
ID ACRES Watershed name
1 5731 Elmore Creek above Elmore Branch
2 1429 South Fork at TN-298
3 2040 South Fork
4 1196 North Fork
5 886 North Fork at TN-298
6 985 Wolfpen Branch at Elmore Creek
7 5003 Elmore Creek nr Genesis gage
8 354 Wolfpen Branch at TN-298
Pr Rockcastle sandstone
Pdl Lower shale
Pv Vandever formation
Pcr Crossville sandstone
Geology Acres Percent Name
Pr 4975 86.8 Rockcastle sandstone
Pdl 378 6.6 Lower shale
Pv 252 4.4 Vandever formation
Pcr 126 2.2 Crossville sandstone
Total 5731 100.0
Rain gage
0 1 2 MILES
0 1 2 KILOMETERS


Fox Creek and Elmore Creek, rainfall
Fox Cr rain
Elmore Cr rain
Rainfall, inches
12.00
10.00
8.00
6.00
4.00
2.00
0.00
October, 2001
December, 2001
February, 2002
April, 2002
June, 2002
August, 2002
October, 2002
December, 2002
February,2003
April, 2003
June, 2003
August, 2003
Month


Fox Creek and Elmore Creek, runoff in inches
Fox Cr runoff,inches
Elmore Cr runoff, inches
Runoff, inches
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
October, 2001
November, 2001
December, 2001
January, 2002
February, 2002
March, 2002
April, 2002
May, 2002
June, 2002
July, 2002
August, 2002
September, 2002
October, 2002
November, 2002
December, 2002
January, 2003
February,2003
March, 2003
April, 2003
May, 2003
June, 2003
July, 2003
August, 2003
September, 2003
Month


Flow Duration, Fox Cr and Elmore Cr
Class limits, cfs
1000.000
100.000
10.000
1.000
0.100
0.010
0
10
20
30
40
50
60
70
80
90
100
Percent exceedance
Fox Cr
Elmore Cr

Paired Basin Study preliminary conclusions:

When the dams are flowing in Fox Creek, the discharge values in Fox and Elmore are similar and consistent between sub-basins.

When Fox Creek dams are not flowing, discharge values are not similar between Fox and Elmore Creek basins, but they are similar for interbasin sub-basins. ET is thought to be the cause.

CSM values are consistent in the downstream direction for both watersheds, indicating either no loss or consistent loss to geology in both basins.

Future actions

- About 25 sub-basins chosen to collect further synoptic measurement suites to test whether the effect of impoundments can be detected
- Update number of impoundments
- Develop index for impoundments, location